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FIELD SAMPLING PLAN

WAUKEGAN HARBOR AREA OF CONCERN
Waukegan, Illinois

Remedial Design

WA No. 244-RDRD-0528 / Contract No. 68-W6-0025

December 2004

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SECTION 1

Introduction

This Field Sampling Plan (FSP) defines the procedures that will be used to perform the Remedial Design (RD) investigation at the Waukegan Harbor site in accordance with the Statement of Work (SOW) for Work Assignment No. 244-RDRD-0528.

This FSP consists of the following:

- Section 1 describes the site location and project history, and presents a general overview of the field activities.
- Section 2 describes the objectives and approach for the sampling program including contaminants of concern and the analytical program.
- Section 3 presents the field investigation program including the field tasks, sampling equipment, and sampling procedures.
- Section 4 provides the general technical guidelines and procedures to be used during the investigation. This section also identifies the sample identification, sample custody procedures and quality assurance/quality control (QA/QC) requirements for sample collection, handling, and shipping.
- Section 5 provides the references cited in this document that were used to develop the model of existing conditions.
- Appendix A includes the Field Operating Procedures (FOPs) for performing the sampling tasks, calibrating the equipment, and completing project forms.

1.1 Site Setting

Waukegan Harbor is located on the western shore of Lake Michigan, about 40 miles north of Chicago, Illinois, in the city of Waukegan, Illinois (Figure 1-1). The harbor is a mostly man-made structure constructed in the late 1800s and early 1900s. A natural inlet and portions of adjacent wetlands were filled to form the present shape of the harbor area. Waukegan Harbor comprises 35 to 40 acres, with water depths varying from 14 to 25 feet. A natural clay/glacial till harbor bottom underlies the softer sediments, which consist of organic silts and/or coarse lake sands. The entire harbor is bordered by 20- to 25-foot-long steel sheet piling, except at the Waukegan Port District boat-launching areas and at the retaining wall near the harbor mouth (IEPA 1994; USEPA 2002).

Waukegan Harbor is an industrial and commercial harbor used by lake-going freighters and recreational boaters. At one time, the Inner Harbor consisted of three operating slips. At a later date, Slip 2 was filled in and National Gypsum built a plant on the site. Slip 3 was removed from service in 1991 as part of the remedial activities for the Outboard Marine Corporation Inc. (OMC) Site and made into a permanent containment cell by constructing a cutoff wall in the harbor. Slip 4 was constructed to replace Slip 3, and officially opened to

the public in July 1991. Slip 4 is used for repair, supply, and as docking facilities for private boats (Larsen Marine). Presently, Slip 1 is the only operating slip for commercial traffic. Recreational boat traffic uses Slip 4 and the public marina located in the southwest corner of the harbor.

Based on current uses and historical activities, the harbor has been divided into the following harbor segments (see Figure 1-2):

- Approach Channel
- Outer Harbor
- Entrance Channel
- Inner Harbor
- Marina
- Inner Harbor Extension
- Slip 1
- North Harbor (includes Slip 4)

The federal navigation channel of Waukegan Harbor includes the Approach Channel, Outer Harbor, Entrance Channel, the Inner Harbor, and the Inner Harbor Extension. The Approach Channel and the Outer Harbor are currently maintained at a depth of -22 feet Lake Michigan Low Water Depth (LWD) (which is the equivalent of a LWD of 577.5 feet above mean sea level), and the Entrance Channel and Inner Harbor are authorized for dredging to a depth of 18 feet LWD (USACE 1995).

1.2 Background

This section provides a brief overview of the history of Waukegan Harbor as it relates to the contaminants of concern and the proposed field investigation. Additional information on the history of contamination, remedial and dredging activities, and investigations has been summarized in the *Remedial Alternative Array Document and Data Gaps Analysis Report* (RAAD/DGAR) (CH2M HILL 2004).

Waukegan Harbor is part of the OMC Superfund Site. The OMC Site includes four operable units (OU): the Waukegan Harbor sites (OU 1 and OU 3), the Waukegan Coke Plant Site (OU 2) on the eastern edge of the Harbor, and the OMC Plant 2 Site (OU 4) north of the harbor. OMC Plant 2 is the source of the polychlorinated biphenyls (PCB) contamination in Waukegan Harbor sediments, causing the harbor to be listed as an International Joint Commission Great Lakes Area of Concern (AOC).

In February 1992, OMC completed a sediment remediation project in the harbor that entailed the dredging, treatment, and disposal of roughly 32,000 cubic yards of PCB-contaminated sediment from the North Harbor area. Dredged sediments were placed in a permanent containment cell constructed in the former Slip 3. Remediated sediments contained an estimated 1,000,000 pounds of PCBs with a maximum PCB concentration of 500,000 parts per million (ppm). Sampling of surficial sediments conducted in 1996 indicated moderate levels of PCB contamination throughout the harbor from the North Harbor area down to the Entrance Channel. In accordance with the 1988 Consent Decree between OMC and U.S. Environmental Protection Agency (USEPA), the Illinois EPA (IEPA)

is responsible for providing the long-term operation and maintenance (O&M) of the containment cells.

OMC dredged the northern harbor area to achieve a cleanup level of 50 ppm for PCBs. However, because fish tissue samples still contain high levels of PCBs, the harbor remains listed as an AOC.

1.3 Sediment Stratigraphy

The generalized stratigraphy of the sediments in Waukegan Harbor includes a thin layer of soft organic silt overlying medium dense fine to coarse sand. Underlying the sand is very stiff silty clay till that ranges from 50 to 100 feet thick.

The uppermost fine-grained sediments are generally described in boring logs as black to gray, loose, very soft to soft silts and clays (USCS soil classification of OL, ML, MH, or CL). These soft silts and clays have relatively high organic contents (about 1 to 19 percent, averaging about 6 percent) and moisture contents (20 to 94 percent, averaging 52 percent). The soft silt and clays were generally observed in samples throughout the harbor, except in the Inner Harbor Extension and the Outer Harbor areas. These materials were encountered at depths of about -13 to -23 feet LWD and range in thickness from about 0.5 foot to 10.5 feet.

In some portions of the Outer Harbor and Entrance Channel, the uppermost sediments encountered consist of gray, loose to very loose, soft sand to silty sand (USCS soil classification of SM). These sands were typically less than 2 feet thick and, when reported on the boring logs, the blow counts over these intervals were recorded as "weight of hammer."

The remaining unconsolidated sediments encountered in Waukegan Harbor are comprised of gray, moderately dense, medium grained sand with varying amounts of silts and clays (USCS soil classification of SC, SM, SP, SW). The sands have about half the amount of organic content (0.04 to 8 percent, averaging 3 percent) and moisture content (16 to 48 percent, averaging 16 percent) as measured in the silts and clays. The depth to the top of the sand layer ranged from about -6 to -24 feet LWD (average of -18 feet LWD). A laterally continuous layer of sand lies from the Outer Harbor area, through the Entrance Channel, and into the eastern portion of the Inner Harbor. The thickness of the sand layer in the Outer Harbor area ranges from 6.5 to 10 feet, in the Entrance Channel from 0.2 foot to 10.5 feet, and in the eastern portion of the Inner Harbor, about 4 feet. The sand in the rest of the Inner Harbor, Inner Harbor Extension, and the North Harbor was generally less than 1 foot thick.

The harbor sediments are underlain by a clay till that is described in boring logs as dark gray, silty clay, firm with low plasticity, with trace amounts of fine to coarse sand and shale (USCS soil classification of CL, ML). Boring logs from cores within the harbor indicate that the glacial till surface generally slopes to the east, ranging from -15.8 feet LWD in the North Harbor area (WIH-1197-007) to greater than -25 feet LWD in the Outer Harbor. The samples of clay till contained lower moisture contents than the surficial silt and clay samples (9.5 to 16 percent, averaging about 13 percent). Geotechnical data of the glacial till indicate that the clays have an apparent unconfined compressive strength of 4.5 tons per square foot or greater.

1.4 Chemical Characteristics

The harbor is dredged periodically in order to maintain access for freighters, barges, and private boats. Both dredging and passage of boats cause sediments in the harbor to be routinely disturbed. Such disturbances mix sediments into the water column, disrupt the benthic zone, and influence harbor water quality.

The database compiled from various sampling events following the most recent dredging activities includes 92 (75 core and 17 grab) samples collected from 58 locations throughout the harbor.

1.4.1 PCB in the Shallow Sediments (0 to 2 feet)

PCBs were detected in 55 of the 57 samples collected within or across the 0- to 2-foot-depth interval. The PCB concentrations ranged from 0.0488 to 29.80 ppm and averaged about 4.3 ppm. The distribution of PCB concentrations in the shallow sediments (that is, 0 to 2 feet) is relatively consistent with the source of the PCBs, dredging operations, and boat traffic. Low concentrations of PCBs (ranging from 0.058 to 6.3 ppm) were detected in the Outer Harbor and Entrance Channel samples. Sediments in the North Harbor, Inner Harbor, Inner Harbor Extension, and Marina contained PCB concentrations generally greater than 1 ppm.

1.4.2 PCB in the Deeper Sediments (> 2 feet)

The frequency of PCBs detected in the deeper sediments from the Inner Harbor, Entrance Channel, and Outer Harbor were similar to the surficial sediment samples. PCBs were detected in 92 percent (25 of 27 samples) of samples representing sediments deeper than 2 feet. The total PCB concentrations ranged from 0.0436 to 23.1 ppm and averaged about 4 ppm. All of the Inner Harbor samples contained total PCB concentrations exceeding 1 ppm. The PCB concentrations detected in the Entrance Channel and Outer Harbor ranged from 0.0436 to 9.34 ppm. It should be noted that the vertical extent of the PCB contamination in the deeper sediments is not well defined in the Outer Harbor and Entrance Channel where greater thickness of sand exist.

1.4.3 PCBs in the Till

Sixteen samples throughout the harbor were comprised of the interval including the base of the sand and top of the till. PCBs were detected in 7 of the 16 till samples, ranging in concentration from 0.0277 to 0.197 ppm and averaging 0.0754 ppm. The results indicate that the till layer is not significantly impacted by the PCBs that occur in the unconsolidated sediments. Low levels of PCBs were detected in the Inner Harbor, Inner Harbor Extension, and the North Harbor. PCBs were not detected in the till of the Marina (one sample), Entrance Channel (three samples), or the Outer Harbor (two samples).

1.5 Remedial Alternatives

1.5.1 Remedial Alternative Evaluation

Based on previous evaluations of the site conditions and potential costs, the potential harbor cleanup alternatives were initially developed and analyzed with regard to three evaluation

criteria (effectiveness, implementability, and cost). The alternative evaluation is documented in the RAAD/DGAR. USEPA is currently focusing on two alternatives and their associated subalternatives that are variations of the initial alternatives (see Table 1-1).

Specifically, all of the preferred harbor cleanup alternatives consist of the following tasks:

- Dredge sediments to depth to remove sediments containing PCB concentrations that are greater than 1.0 ppm in order to achieve a surface-weighted average (SWAC) PCB concentration of less than 0.25 ppm in the harbor
- Dredge "clean" sediment in the navigational channel to 18 feet below Lake Michigan LWD
- Dewater/stabilize and dispose of sediments as determined by USEPA

USEPA plans to implement the preferred harbor cleanup alternative at Waukegan Harbor in Fiscal Year 2006, pending funding availability.

1.5.2 Data Gaps Analysis

Limitations in the existing sediment physical and chemical data were identified during the development of the remedial alternative array and the cost estimates. The data gaps identified in the RAAD/DGAR included:

- Determination of the volume of PCB-contaminated sediment.
  - North Harbor, Inner Harbor Extension, and Inner Harbor have relatively thin sediment layer and do not require a large amount of additional characterization.
  - Marina requires substantial sampling because the sediment in this segment is relatively thick and the cost of sediment removal is high given the presence of docks and piles throughout the area.
  - Entrance Channel and Outer Harbor investigation is required because of the limited sampling in the past and because of the potentially large volumes of sediment, potentially uncontaminated, that would be dredged for navigational purposes.
- Verification of PCB concentrations in the till. Low concentrations of PCBs in the till could have implications for beneficial reuse of the glacial till in areas outside of the OMC Superfund Site.
- Determination of sediment dewatering characteristics, water treatment requirements, and evaluation of hydraulic vs. mechanical dredging. Dewatering, water treatment, and dredging techniques have large effects on a dredging project's cost, and data to allow more precise estimates of these costs are needed.

1.6 Overview of Remedial Design Investigation

The purpose of the RD investigation activities at the Waukegan Harbor AOC is to provide data to complete and deliver the final plans and specifications for the preferred harbor cleanup alternative that will allow delisting of Waukegan Harbor as an AOC while keeping

the harbor available as an active, working harbor. Specifically, the objectives of the field investigation are to:

- Delineate the horizontal and vertical extent (and estimate volumes) of PCB-containing materials (total PCB concentrations of > 1 ppm and SWAC > 0.25 ppm) within the harbor
- Evaluate bioavailability of PCBs within nonnavigational areas (North Harbor and Marina) where dredging is not required to be conducted to navigational dredge depth (that is, 18 feet below LWD). The evaluation will use total organic carbon (TOC) results to approximate the bioavailability of PCBs, and no bioaccumulation testing will be performed.
- Assess geotechnical characteristics of the PCB-containing material, as well as non-PCB-containing materials (total PCB concentrations < 1 ppm) within the navigational channel (Outer Harbor, Entrance Channel, Inner Harbor, and Inner Harbor Extension) down to the navigational dredge depth of 18 feet below the LWD, for the purpose of assessing options for removal, dewatering/staging, disposal, and beneficial reuse of sediments

The specific sampling objectives and data collection rationale and methodologies are discussed in detail in the following sections.

SECTION 2

Sample Network Rationale

2.1 Project Objective and Approach

The field investigation is designed to collect information to be used to evaluate the existing site conditions within the sediments of Waukegan Harbor. Identified sampling will verify existing data, fill in data gaps, and collect the site-specific information needed to prepare the RD. The data will be utilized to delineate the extent of sediments within the harbor containing PCB concentrations greater than 1 ppm. Data will also be collected to better characterize the sediment physical properties in order to evaluate dredging, dewatering, treatment, and disposal of the sediments within the harbor.

The proposed investigation includes the following types of samples:

- Systematic collection of sediment cores at locations based on a triangular grid
- Sediment cores from selected locations within harbor areas that have historically been shown to contain a greater thickness of soft sediments
- Field duplicate samples and collocated cores (additional cores collected at a random direction and distance from the original core) to assess field variability.
- Matrix spike/matrix spike duplicate (MS/MSD) samples to assess sample variability.
- Field equipment blanks collected following decontamination procedures to assess potential carryover of nondedicated sampling equipment.

Field sampling locations will be surveyed and recorded using a digital global positioning system (DGPS), or equivalent, capable of station positioning (x and y coordinates) within 1 meter, and providing z-elevations real time. Sediment cores will be collected using a barge-mounted drill rig or similar equipment capable of collecting deep sediment cores (within 15 to 25 feet water depth) consisting of soft silt, up to 10 feet of fine and coarse sand, and clay till. Field notes at each location will record: date, time, personnel, weather conditions, station ID, x-coordinate, y-coordinate, z-elevation (top of water), water depth, sediment probed depth (to top of clay/till), sediment core penetration, sediment core recovery, and core descriptions.

All core sections will be analyzed for PCB Aroclors using a laboratory in USEPA's Contract Laboratory Program (CLP). A subset of the core sections (minimum of 10 percent) will also be analyzed for TOC, asbestos, and geotechnical properties. Laboratory analyses for the non-PCBs will be performed by a laboratory subcontracted by CH2M HILL.

2.2 Analytical Program

In developing the general chemical analytical program for the Waukegan Harbor RD investigation, the project objectives and the following elements were considered:

- Identification of target compounds with respect to historic operations, chemical usage, and the results of previous investigations
- Determination appropriate and acceptable analytical methodology that meets the data quality objectives (DQOs), including site specific applicable, or relevant and appropriate requirements (ARARs)
- Determination of an effective analytical program with appropriate QA/QC requirements such that site sampling location and frequency is optimized

2.2.1 Contaminants of Concern

Contaminants of concern are defined as those most likely to contribute a risk as a result of exposure. Based on the results of the previous investigations conducted by USEPA, IEPA, and the United States Army Corps of Engineers (USACE), the primary contaminants at the site are PCBs. A secondary contaminant of concern within the Waukegan Harbor is asbestos, due to its historical use of the product by industries surrounding the harbor.

2.2.2 Analytical Objectives

Previous investigations conducted by USACE, IEPA, and USEPA indicate that total PCB concentrations in the Waukegan Harbor sediments are present at levels greater than the remedial action limit of 1 ppm total PCBs. The data generated during the RD investigation and associated analytical program will be used in the RD to achieve the remediation objectives.

The extent of sediment contamination will be based on the comparison of the analytical sediment results with the remedial action limit. Asbestos results will provide a qualitative assessment of presence or absence. The data will used to determine the suitability of the ultimate disposal location for the sediments removed from the harbor during future remedial activities.

2.2.3 Contract Laboratory Program Analysis

Analytical laboratories in USEPA's CLP will be utilized to the extent possible. The use of CLP is dependent on the media to be analyzed, specific analyses, and required turn-around times. The ability for the CLP to meet the specific media objectives will be discussed in the *Quality Assurance Project Plan* (QAPP).

Early in the week, prior to the collection of samples requiring CLP analysis, USEPA's Regional Sample Control Center (RSCC) will be notified of the expected date of shipment and anticipated sampling duration, estimated number of samples to be collected, sample matrices, required analyses, and analytical turn-around times. CH2M HILL will collect the samples as scheduled and ship them to the CLP laboratories, identified by RSCC. The RSCC or Contract Laboratory Analytical Services Support (CLASS) personnel, as directed, will be notified of sample arrival on the day of shipment or at the start of the next business day.

Sediment samples (and associated QA/QC samples) will be submitted to the assigned CLP laboratory and analyzed for PCBs. Field equipment blanks (rinse water) will also be submitted to the assigned CLP laboratory for analysis of PCBs to assess the effectiveness of field decontamination procedures.

The specific analyte lists and required reporting limits for the CLP-laboratory analyses will be presented in the QAPP. The analytical methods will be selected such that the quantitation limits for the contaminants of concern achieve the remediation objectives.

2.2.4 Independent Laboratory Analysis

It is anticipated that some of the samples cannot be submitted to the CLP and will need to be analyzed by an independent laboratory procured by CH2M HILL. These Special Analytical Services (SAS) will likely include sediment samples for analysis of asbestos, TOC, and geotechnical parameters (moisture content, bulk density, grain size, specific gravity, Atterberg limits, and organic content). The specific media, numbers of samples, and the method requirements for the analyses conducted by these independent offsite laboratory(ies) will be discussed in the QAPP.

2.3 Sediment Investigation

2.3.1 Investigation Objectives

The overall objective for the sediment sampling activities within Waukegan Harbor is to define the nature and extent of PCB contamination and to assess physical characteristics of the sediment to help develop the plans and specifications for the harbor cleanup alternative that will allow delisting of Waukegan Harbor as an AOC. The data from the previous investigations conducted provide a broad picture of the sediment PCB extent and site physical conditions. However, to more accurately delineate the horizontal and vertical PCB extent and to better characterize the site conditions, a focused field investigation will be conducted to fill in data gaps identified based on evaluation of the existing data (CH2M HILL 2004).

The key elements in developing the sampling approach include:

- Sediments within areas defined as the navigation channel (Inner Harbor Extension, Inner Harbor, Entrance Channel, and Outer Harbor) will be dredged to 18 feet below the LWD, regardless of sediment PCB concentrations. All soft sediments (silt and sand) will be sampled for PCBs in these areas. To assess possible beneficial reuse, sampling of the till (clay) layer in these areas will be conducted if the till is shallower than 18 feet below the LWD.
- Surficial sediments within areas outside the navigation channel (North Harbor, Slip 1, and Marina) will be assessed for determination of PCB bioavailability based on the PCBs and TOC results.
- Soft sediment (defined as silt and sand) thicknesses in the North Harbor and the Inner Harbor Extension are relatively shallow (typically less than 12 inches) and likely contain PCB concentrations above the remedial action limit of 1 ppm total PCBs. Further vertical delineation would not be cost effective because the PCB concentrations are elevated and the sediment volume is relatively small.

- The North Harbor is the area closest to the historical source of PCBs. Analysis of the till (clay) layer within the North Harbor would provide a conservative assessment of the levels of PCBs within the till for the harbor.
- Slip 1 was dredged to a depth of -19 feet LWD in July 2003. Limited sampling will be conducted to confirm that PCB concentrations within Slip 1 are less than the remedial action limit.
- Soft sediments contained within the Inner Harbor have historically been shown to contain elevated PCB concentrations (that is, greater than 1 ppm total PCBs). Extensive vertical delineation of PCB concentrations would not be cost effective. However, segregation of various sediment types (silt, sand, and clay) would help provide data for the purposes of developing appropriate remedial alternatives.
- The Marina is not a well-characterized area. Delineation of the PCB extent (horizontal and vertical) is important due to the potential high cost of sediment removal around the docks within the Marina. Segregation of various sediment types (silt, sand, and clay) would help provide data for the purposes of developing appropriate remedial alternatives.
- The Entrance Channel and the Outer Harbor historically show total PCB concentrations near or below the remedial action limit of 1 ppm. Horizontal and vertical characterization of the PCBs is necessary to allow for a more accurate delineation of the extent of sediments containing greater than 1 ppm and SWAC of 0.25 ppm total PCBs. Segregation of various sediment types (silt, sand, and clay) would help provide data for the purposes of developing appropriate remedial alternatives.

2.3.2 Sampling Approach

Sediment samples from within the Waukegan Harbor will be collected using a barge-mounted drill rig or similar equipment. Sediment sample intervals will range from between 4 and 12 inches in length. All sediment sampling locations will be subsampled and analyzed for PCBs. A minimum of 10 percent of the core locations will be subsampled and analyzed for asbestos, TOC, and geotechnical parameters for evaluation of various remedial methods.

The proposed investigation includes the systematic collection of sediment cores based on an approximately 220-foot triangular grid (approximately 1 core per acre). Additional cores have been located to increase the sample density within harbor segments that have historically been shown to contain a greater thickness of soft sediments (that is, the area between the Marina and the Inner Harbor, and the southeast corner of the Inner Harbor Extension). A total of 53 core locations are proposed to define the extent of PCBs as part of this RD investigation. The proposed sediment core locations are shown in Figure 2-1. A summary of the sampling approach and rationale is provided in Table 2-1. Sediment samples from a total of 70 sediment core locations will be collected, including collocated cores and cores for analysis of asbestos, TOC, and geotechnical parameters. The sampling approach for each Waukegan Harbor segment is summarized below.

2.3.2.1 North Harbor

A total of 8 core sampling locations are proposed for the North Harbor. Due to the limited thickness of soft sediments and the historically elevated PCB levels found within the North Harbor, one composite sample will be collected of the entire section of silt and sand from each core sampling location, with a maximum sampling thickness of 12 inches. The top core section will also be analyzed for TOC to evaluate PCB bioavailability within the North Harbor. Additionally, the top 12 inches of the till (clay) will be collected for PCB analysis at each core sampling location.

At 2 of the 8 sediment core locations, an additional section of core will be collected and analyzed for asbestos, TOC, and the geotechnical parameters.

2.3.2.2 Inner Harbor Extension

A total of 5 core sampling locations are proposed for the Inner Harbor Extension. Similar to the North Harbor, one composite sample will be collected of the entire section of silt and sand from each core sampling location (maximum sample thickness of 12 inches) due to the limited thickness of soft sediments and the historically elevated PCB levels found within the Inner Harbor Extension. The top 12 inches of the till (clay) will also be collected for PCB analysis at each core sampling location.

Due to the limited relative area of the Inner Harbor Extension, an additional section of core from only one of the five sediment core locations will be sampled and analyzed for the asbestos, TOC, and the geotechnical parameters.

2.3.2.3 Slip 1

Limited sampling is proposed for this area due to the recent dredging activities conducted within Slip 1. Two surficial sediment samples will be collected for analysis of PCBs and TOC. Samples will not be collected for analysis of asbestos or geotechnical parameters. If elevated PCB levels are found in this area, further characterization of the sediments may need to be conducted in the future.

2.3.2.4 Inner Harbor

A total of 11 core sampling locations are proposed for the Inner Harbor. Soft sediments contained within the Inner Harbor have historically been shown to contain elevated PCB concentrations (that is, greater than 1 ppm total PCBs). Within this area, various sediment types (silt and sand) will be segregated for analysis, if possible, for the purposes of developing appropriate remedial alternatives. Twelve-inch (maximum) core sections of the segregated sediment types will be collected for analysis of PCBs. Till (clay) samples are not anticipated to be collected because, based on historical data, the till (clay) layer is not projected to be shallower than 18 feet below the LWD and the till is not anticipated to be contaminated with PCBs due to its distance from the OMC plant site, the original source of PCBs.

An additional core from 2 of the 11 sediment core locations will collected and analyzed for asbestos, TOC, and the geotechnical parameters.

2.3.2.5 Marina

A total of 8 core sampling locations are proposed for the Marina area. Accurate delineation of the PCB extent (horizontal and vertical) is important within the Marina due to the potential high cost of sediment removal around the docks and because the Marina has not been well characterized. At each core location, the top 4 inches of sediment will be collected for analysis of PCBs and TOC to assess PCB bioavailability. Following the top 4-inch section, 6-inch sections of silt and 12-inch sections of sand will be collected for analysis of PCBs. Collection of till (clay) samples will not be required.

An additional core from 2 of the 8 sediment core locations will collected and analyzed for analysis of asbestos, TOC, and the geotechnical parameters. Twelve-inch (maximum) core sections will be collected, segregated by sediment type (silt and sand), for this analysis.

2.3.2.6 Entrance Channel

A total of 7 core sampling locations are proposed for the Entrance Channel. The Entrance Channel has historically shown total PCB concentrations near or below the remedial action limit. Therefore, horizontal and vertical characterization of the PCBs is necessary to allow for a more accurate delineation of the extent of sediments containing greater than 1 ppm total PCBs. At each core location, 6-inch sections of silt and 12-inch sections of sand will be collected for analysis of PCBs. Up to the top 12 inches of till (clay) will be collected for analysis if the elevation of the till is shallower than 18 feet below the LWD.

Within the Entrance Channel, an additional core from 2 of the 7 sediment core locations will be collected of for analysis of asbestos, TOC, and the geotechnical parameters. Twelve-inch (maximum) core sections will be collected, segregated by sediment type (silt, sand, and clay), for this analysis.

2.3.2.7 Outer Harbor

A total of 12 core sampling locations are proposed for Outer Harbor. The Outer Harbor has historically shown total PCB concentrations near or below the remedial action limit. Therefore, horizontal and vertical characterization of the PCBs is necessary to allow for a more accurate delineation of the extent of sediments containing greater than 1 ppm total PCBs and to allow calculation of a PCB SWAC. At each core location, 6-inch sections of silt and 12-inch sections of sand will be collected for analysis of PCBs. Up to the top 12 inches of till (clay) will be collected for analysis if the elevation of the till is shallower than 18 feet below the LWD.

An additional core from 2 of the 12 sediment core locations will be collected for analysis of asbestos, TOC, and the geotechnical parameters. Twelve-inch (maximum) core sections will be collected, segregated by sediment type (silt, sand, and clay), for this analysis.

2.4 Assessment of PCB Variability

In order to assess the inherent variability of PCB concentrations in sediments within the Waukegan Harbor, a pseudonested approach to collocated sampling will be utilized. Variability of PCB concentrations based on spatial distribution will be evaluated by collecting field duplicate and collocated samples.

One core location within each of the areas (excluding Slip 1) will be selected for the evaluation of PCB variability. Core sections will be subsampled for PCBs as described in Section 2.3, depending upon the area. At this native core location, a field duplicate sample will be collected by collecting subsamples from each of the core sections and submitting them to the laboratory for individual analysis. Additionally, one additional sediment core (a collocated core) will be collected at a random direction and distance (of no more than one-half the distance between grid points [for example, distances ranging from 5 to 110 feet away from the native core location]). These cores will also be subsampled for PCBs as described in Section 2.3. MS/MSD samples will also be collected and analyzed at a frequency of roughly 5 percent to evaluate sample variability.

SECTION 3

Field Investigation Program

The field investigation program was developed based on investigation objectives, current site conditions, available information on past activities and suspected source areas, available physical and chemical data, and knowledge of the proposed remedial alternatives (based on the SOW [USEPA 2004]).

3.1 Objectives

The main objectives for the field investigation are to:

- Delineate the horizontal and vertical extent (and estimate volumes) of PCB-containing materials (total PCB concentrations of > 1 ppm and SWAC > 0.25 ppm) within the harbor
- Determine the presence and extent of asbestos within the harbor sediments
- Evaluate the bioavailability of PCBs within nonnavigational areas (North Harbor, Slip 1, and Marina) where dredging is not required to be conducted to navigational dredge depth (that is, 18 feet below the LWD of 577.5 feet above mean sea level). The evaluation will use TOC results to approximate the bioavailability of PCBs, and no bioaccumulation testing will be performed.
- Assess geotechnical characteristics of the PCB-containing material, as well as non-PCB-containing materials (total PCB concentrations < 1 ppm) within the navigational channel (Outer Harbor, Entrance Channel, Inner Harbor, and Inner Harbor Extension) down to the navigational dredge depth, for the purpose of assessing options for removal, dewatering/staging, disposal, and beneficial reuse of sediments

3.2 Tasks

The following tasks will be performed to complete the field investigation objectives:

- Site Reconnaissance—Prior to the start of sampling activities, a site reconnaissance will be conducted to define a staging area for sediment sampling activities. The properties surrounding the Waukegan Harbor will also be visually surveyed to identify potential areas for dewatering/staging purposes during the RA. Water lines which underlie the harbor will also be verified during this site reconnaissance activity.
- Mobilization—This task will consist of site preparation (locating and setting up the staging area), mobilizing the equipment to the site prior to the field activities, and establishing the field office.
- Sediment Sampling—Sediment sampling will be conducted to generate sample data to define the current extent of sediments containing PCB concentrations exceeding 1 ppm

and SWAC of 0.25 ppm. To a lesser extent, a qualitative determination will be made of the presence and extent of asbestos fibers within the sediments. PCB bioavailability will also be assessed based on TOC and PCB results for samples from the nonnavigational channel areas (North Harbor, Slip 1, and Marina). Geotechnical information will be compiled to evaluate the feasibility of various remedial methods.

- Dispose of Investigation Derived Wastes (IDW)—This task will include characterizing and disposing of IDW in accordance with local, State, and Federal regulations.
- Demobilization—At the completion of fieldwork, personnel, facilities, equipment, and supplies will be demobilized from the site.

3.3 Field Operations and Procedures

This section provides an overview of the equipment, operations, and procedures that will be performed during the field investigation. It also references specific FOPs in Appendix A which provide step-by-step procedures for conducting the field task. In the instances where FOPs are not referenced, the text of that section will act as the FOP.

3.3.1 Site Reconnaissance

Site reconnaissance tasks will be completed prior to the start of sampling activities. Site reconnaissance tasks will include:

- Confirming health and safety information including the route and travel time to the hospital specified in the Health and Safety Plan (HASP) and the addresses of local fire and police departments
- Locating the Federal Express office nearest the site and note its hours of operation, and determining whether the office will provide sample pick-up service
- Selecting a proper location to be used as a staging area for sediment sampling activities
- Visually surveying the properties surrounding the Waukegan Harbor to identify potential areas for dewatering/staging purposes during the remedial action
- Verifying the locations of water lines underlying the harbor
- Mapping the locations and conditions of survey markers surrounding the site for use as daily survey check points
- Inspecting proposed sampling areas to determine if modifications are necessary based on structural limitations (docks, etc.) or other potential hazards (water lines, etc.), and recording any necessary modifications in the field log book along with the reason for the modification

The level of health and safety protection during the site-reconnaissance activities will be Level D.

3.3.2 Mobilization

Prior to initiating any field work, the following preparatory activities must be completed:

- Mobilize and set up support facilities (phone, electricity, water, security [if necessary])
- Mobilize all field office equipment and supplies (computer, printer, water cooler)
- Identify and set up temporary IDW storage area
- Identify and contact all utility companies to get underground utility clearance for all sampling locations
- Obtain and transport to the site the identified field supplies (for example, personal protective equipment [PPE], sample containers, preservatives, sample forms and other related items) and field monitoring equipment
- Mobilize drilling contractor and supplies and materials
- Confirm that analyses are scheduled through the USEPA CLP and the independent laboratories
- Confirm that field equipment is in proper working order and has received appropriate QC checks
- Collect and analyze samples of water that will be used for decontamination purposes

During mobilization activities, the Field Team Leader (FTL) will perform walk-through inspection of the site and generate field sampling maps. The level of health and safety protection during the mobilization activities will be Level D.

3.3.3 Sediment Sampling

The sediment investigation will be conducted to collect data that will be used to:

- Delineate the horizontal and vertical extent of sediments within Waukegan Harbor containing PCB levels > 1 ppm and SWAC > 0.25 ppm.
- Determine the sediment volume in Waukegan Harbor that will require remediation
- Assess the bioavailability of PCB-containing sediments in the North Harbor and the Marina using TOC and PCB results. No bioaccumulation testing will be performed.
- Determine the presence and extent of asbestos within the harbor
- Characterize the geotechnical properties of site-specific sediments (for example, grain size, bulk density, moisture content, Atterberg limits, organic carbon, and specific gravity) that will be used in the evaluation of contaminant fate and transport, the analysis of risk, and the remedial alternative evaluation

Sediment cores will be collected from a total of 53 locations based primarily on an approximately 220-foot triangular grid (approximately 1 core per acre). The proposed sediment core locations are shown in Figure 2-1. Sediment cores will be subsampled selectively for PCBs, depending upon the segment from which the core is collected, as described in Section 2.3.2. At a minimum of 10 percent of the sampling locations, core sections will also be analyzed for TOC, asbestos, and geotechnical parameters.

Sediment cores will be collected using a barge-mounted drill rig (for example, hollow-stem auger) capable of collecting samples using a split spoon sampler, or equivalent methods, which are capable of collecting sediment cores containing up to 10 feet of fine and coarse sand and up to the top 12 inches of till (clay). Procedures and equipment for sediment core and sample collection are presented in:

- FOP-01 *Hollow-Stem Auger Drilling and Sediment Sample Collection*
- FOP-05 *Drilling Rig and Heavy Equipment Decontamination*

3.3.4 IDW Characterization and Disposal

Materials that may become IDW and require proper treatment, storage, and disposal are:

- PPE, including disposable coveralls, gloves, booties, etc
- Disposable equipment (DE), including plastic ground and equipment covers, aluminum foil, aluminum pans, broken or unused sample containers, tape, etc.
- Sediment cuttings from drilling
- Decontamination water and liquids

PPE and DE, after decontamination, will be treated as debris and will be placed in a dumpster. PPE that is not decontaminated will be stored in 55-gallon drums. This waste will be disposed of in accordance with the procedures presented in the *Waste Transportation and Disposal Plan*.

The solid and liquid wastes generated during the core sampling will be collected and temporarily stored on the barge, during daytime working hours, in 5-gallon buckets. Containers will be appropriately labeled and transferred for temporary storage in the OMC Plant 2 building for later disposal. The solid and liquid waste will be characterized and disposed of with the OMC Plant 2 remedial investigation IDW or during the harbor remedial action.

3.3.5 Demobilization

Upon conclusion of the field activities, all of the support facilities and equipment from the site will be demobilized. All equipment and tools will be properly decontaminated before they are demobilized from the area. No site restoration activities are anticipated to be necessary.

SECTION 4

General Field Operations

4.1 Sample Management

The section describes the procedures to be implemented so that once representative environmental samples are obtained, they are properly containerized, preserved, shipped, and otherwise handled in a manner that will maintain sample integrity. The use of these techniques will provide representative samples and will reduce the possibility of sample contamination from external sources.

4.1.1 Sample Identification

A sample numbering system will be used to identify each sample, including duplicate and blank samples. The sample number used will enable each sample to have a unique identifier, required by Earthsoft's EQuIS Site Management software, that is compatible with USEPA's EDMAN electronic data deliverable (EDD) format.

Each sample to be analyzed by the CLP will be assigned a unique CLP sample number and analyzed by a designated laboratory under an assigned Case Number. The CLP sample numbers are obtained from a block of numbers provided by the USEPA Region 5 RSCC.

Samples analyzed by an independent laboratory outside the CLP program will be assigned a unique sample number made up of a SAS number followed by a unique two-digit, sequential, numerical suffix. The SAS numbers are assigned by the CH2M HILL sample coordinator.

Each sample, regardless of analytical protocol, will also be assigned a CH2M HILL site-specific identifier that will contain a project identification code (WH signifies the Waukegan Harbor AOC site), and a sample-specific station location identifier, which indicates where the sample was collected. Samples will use a sequential numbering system that will include the sample depth.

The sample number and station location identifier will be included on the sample tag and the traffic report/chain-of-custody (COC) record.

The site-specific identifier will be based on the following system:

- Site – Always WH
- Station Location – The station location identifier is the unique name of the sampling location (for example, sediment core location, etc.). The location name will vary depending on the reason for sampling and the numeric location number assigned to that location. The location name is five characters long – two letters followed by three numerals.

  - The two letters will indicate one of the following types of sample locations:
    - SD—Sediment drilling/auger coring location
    - EB—Equipment blank
    - WA—Investigation derived waste
  - The three numerals, following the two-letter sample type, will consist of a location number sequentially generated based upon the order in which the sampling is performed. For example, the third sediment sample location would be SD003. Where a number of different sample types will be collected at a single location, the station location number shall be duplicated for each sample type collected at that location.

- Depth indicator—The sample depth will be appended to the station location and consist of a hyphen followed by the starting and bottom depth intervals separated by a slash. This indicator will provide the depth that represents the start and end of the sample interval in inches below the sediment/water interface. For example the sample depth designation will be "-06/12" for the sample collected from an interval of 6 to 12 inches below the sediment/water interface.
- QA/QC Identifier—Field QA/QC samples will be identified using the following QA/QC identifiers:
  - Field equipment blanks, which are not associated with an individual station location, are numbered sequentially and are identified by the first two letters of the station location code (for example EB001 is an equipment blank).
  - Field duplicates, which are associated with the same station location as the native sample, are identified with an "R" (for "replicate") appended to the end of the location code. For example, the duplicate of sample WH-SD002-05 would be labeled WH-SD002-05R.
- Laboratory QA/QC Samples—A sample collected for laboratory QC (laboratory spike samples) is considered to be a single sample, even though additional volume is provided to the laboratory. Consequently, all laboratory QC samples are assigned a single sample number and station location identifier. Laboratory QC samples are not identified in the station location code, but rather are called out on the COC form in the "Samples to be used for laboratory QC" field, and on the sample tag.

4.1.2 Sample Containers

The contaminant-free sample containers (bottles) used in this sampling effort will be purchased from an approved vendor or prepared by the subcontracted laboratory. All sample containers for laboratory analyses will meet or exceed the USEPA requirements specified in Office of Solid Waste and Emergency Response (OSWER) Directive #9240-05A, *Specifications and Guidance for Obtaining Contaminant-Free Containers* (April 1990). Bottles used for the sampling activity will not contain target organic and inorganic contaminants exceeding the level specified in the above mentioned document. Specifications for the bottles will be verified by checking the supplier's certified statement and analytical results for each bottle lot.

Equipment (field) blanks will be used to monitor for contamination. Corrective actions will be taken as soon as a problem is identified and may include:

- Discontinuing the use of a specific bottle lot
- Contacting the bottle supplier(s) for retesting the representative bottle from a suspect lot
- Assessing decontamination procedures
- Resampling the suspected samples
- Validating the data

Table 4-1 presents a summary of sample containers needed for the various field investigations to be performed as part of the field investigation.

4.1.3 Sample Preservation and Holding Times

Sample containers, preservatives and sample holding times will meet the requirements set forth by the USEPA. Sample containers will be certified by the laboratories or vendors as precleaned. All samples for chemical analysis will be transported to the laboratory in temperature-controlled coolers. Ice will be used to maintain the internal cooler temperature at 4 $\pm$2°C during sample collection and shipment to the laboratory. A summary of preservation/storage requirements and holding times for the analyses to be performed are provided in Table 4-1.

4.1.4 Sample Handling, Packaging and Shipment

Sample handling, packaging and shipping procedures are described in *FOP-02 Sample Handling, Packaging, and Shipping.*

Sample coolers will be shipped to arrive at the CLP or independent laboratories the morning after sampling (priority overnight) or will be sent by a courier to arrive the same day. For non-CLP samples analyzed at an independent laboratory, the laboratory will be notified of the sample shipment and the estimated date of arrival of the samples being delivered.

4.2 Field Activity Documentation and Logbook

Several procedures will be implemented by CH2M HILL to document the location, media and parameters of samples collected in the field. These procedures require that a bound field logbook be maintained to record the acquisition of each sample, both for CLP and independent laboratory analysis; sampling locations be photographed; COC forms for all environmental samples and field QC samples be completed; parameter data generated as a result of sampling activities be maintained on file; and field sampling locations be surveyed and recorded using a digital global positioning system (DGPS), or equivalent, capable of station positioning (x and y coordinates) within 1 meter, and providing z-elevations real time. Field notes at each location will record: date, time, personnel, weather conditions, station ID, x-coordinate, y-coordinate, z-elevation (top of water), water depth, sediment probed depth (to top of clay/till), sediment core penetration, sediment core recovery, and core descriptions. The following describes the sample documentation methods that will be used at the Waukegan Harbor site.

4.2.1 Field Logbook

A field sampling logbook will be initiated at the start of the first onsite activity and maintained to document field activities throughout the field effort in accordance with *FOP-03 Field Logbook.*

4.2.2 Photographic Documentation

The FTL or designee will selectively photograph field activities to complement descriptions of field activities in the field logbook. The following information will be recorded in the logbook when photographs are taken:

- Date and time
- Exposure number/roll number or digital file name
- Location of the photograph
- Description and identification of the subject
- The initials of the person who took the photograph.

Photographs will be maintained by CH2M HILL for reference during the project. At the submission of a final report, CH2M HILL will deliver the captioned photographs in an album to the USEPA.

4.2.3 Sample Chain-of-Custody

For samples collected for analysis, the USEPA COC protocols will be followed, as described in the *National Enforcement Investigations Center (NEIC) Policies and Procedures,* EPA-330/9-78-DDI-R, Revised June 1985. COC forms will be completed through the use of USEPA's Field Operations Reporting Management System (FORMS) II Lite software program. Custody procedures are described in Section 2.3.2 of the QAPP. The protocol for filling out the COC is provided in *FOP-04 Documentation/Chain-of-Custody Procedures.*

4.3 Field Parameter Documentation

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks, data sheets, and/or forms, and entered into an electronic data log. Data will be reviewed by the FTL for adherence to the QAPP/FSP and consistency of data. Any concerns identified will be corrected and incorporated into the data evaluation process.

Field data calculations, transfers, and interpretations conducted by the field team will also be reviewed by the FTL. The field data logs and documents will be checked for the following:

- General completeness
- Readability
- Clearly-stated use of appropriate procedures and modifications to sampling procedures
- Appropriate instrument calibration and maintenance records (as appropriate)
- Reasonability of data collected
- Correctness of sample locations
- Correctness of reporting units, calculations, and interpretations

Where appropriate, field data forms and calculations will be processed and included in appendixes to the appropriate report. Original field logs, documents, and data reductions will be kept in the project file.

4.4 Quality Control Sample Procedures

Each of the offsite laboratories identified in the QAPP will have a QC program to ensure the reliability and validity of the analyses being performed. Field sampling precision and bias will be evaluated by collecting field duplicate samples, collocated samples, and equipment (field) blanks for laboratory analysis.

4.4.1 Decontamination Water

Water will be used to decontaminate sampling equipment (for example, stainless-steel trays, split-spoons) after each use and may be used for drilling purposes. In order to ensure that this water will not cause cross-contamination, the source water will be demonstrated analyte-free prior to performance of environmental sampling. The criteria for analyte-free water will be determined by the detection limits of the laboratory methods used for analysis of the sample analytes.

If water used for the above noted purposes is found to contain common laboratory contaminants (methylene chloride, toluene, acetone, 2-butanone, and phthalate esters) or contaminants related to potable water chlorination at concentrations less than 10 times the concentration detected in a blank (that is, trip blank, rinsate blank), the water will be considered appropriate for use for drilling and decontamination purposes.

4.4.2 Field Duplicates

Field duplicate samples will be used to measure the heterogeneity of the sample matrix and the precision of the field sampling and analytical process. Duplicate samples will be collected at a frequency of about 5 percent. Duplicate samples will be collected from all samples from one core location in each of the areas sampled (excluding Slip 1).

Field duplicate samples will be collected by placing the sediment in a decontaminated stainless steel bowl (or a disposable aluminum pan), mixing the sample by stirring, and filling the individual sample and duplicate containers from the bowl.

4.4.3 Collocated Samples

At the same core locations where field duplicates are being collected (one location per area, excluding Slip 1), one collocated core (an additional core collected at a random direction and distance away from the native core location) will be collected to evaluate spatial variability. The collocated core will be subsampled similar to the native core location.

4.4.4 Equipment Blanks

Equipment (field) blanks will be collected and analyzed to determine whether the decontamination procedure has been adequately performed and that there is no cross-contamination of samples occurring due to the equipment or residual decontamination solutions. A consistent volume of demonstrated analyte-free distilled and

deionized water will be poured directly into or over the decontaminated sampling equipment and then collected in a sample container. The sample bottles will be labeled as described in the plan. At least one equipment blank will be collected per piece of nondedicated equipment utilized during field activities which comes in contact with the sediment samples.

4.4.5 Matrix Spike/Matrix Spike Duplicate

MS/MSD samples will be used by the laboratories to assess the precision and accuracy of sample analysis. The MS/MSD samples will be fortified by the laboratories in accordance with the specifications of the analytical methods. Two extra volumes of sample are required for each combination of MS/MSD samples. Sample containers will be filled and stored in the same manner as field duplicate samples. The frequency for collection of MS/MSD samples will be at least 5 percent.

4.4.6 Temperature Blanks

A temperature blank will be included in each cooler to allow the laboratory receiving the shipment of samples to determine if the samples have been maintained at the proper temperature. Temperature blanks will consist of a unpreserved sample container filled with distilled water. One temperature blank will accompany each sample cooler being shipped to the laboratory.

4.5 Decontamination Procedures

Decontamination of personnel and sampling, monitoring, and heavy equipment will follow the procedures presented in *FOP-05 Decontamination of Drilling Rigs and Equipment* and *FOP-06 Decontamination of Personnel and Sampling Equipment*. The potable water to be used in equipment decontamination will be either from bottles or from a public water supply system. A sample of the water from each source used will be collected at the time of its first use and sent for PCB analysis.

4.6 Disposal of Investigation Derived Wastes

The waste materials generated during a field investigation are known as IDW. Materials, which may become IDW and require proper treatment, storage and disposal are:

- PPE, including disposable coveralls, gloves, booties, etc
- DE, including plastic ground and equipment covers, aluminum foil, aluminum pans, broken or unused sample containers, tape, etc.
- Sediment cuttings from drilling
- Decontamination water and liquids

Management of IDW and materials will be performed consistent with the USEPA guidance *Guide to Management of Investigation-Derived Wastes*, 9345.3-03FS, dated January 1992. Disposable equipment (including PPE) and debris will be containerized and appropriately labeled during the sampling events, and will be disposed of accordingly.

All sediment waste associated with core sampling will be collected and temporarily stored on the barge, during daytime working hours, in 5-gallon buckets. Containers will be appropriately labeled and transferred for temporary storage in the OMC Plant 2 building for later disposal.

Equipment will be decontaminated, as appropriate, as discussed in Appendix A, FOP-05, *Decontamination of Drilling Rigs and Equipment*, and FOP-06, *Decontamination of Personnel and Equipment*. Liquid IDW will be containerized, appropriately labeled during the sampling events, and temporarily stored in the OMC Plant 2 building for later disposal. The sediment and liquid waste will be characterized and disposed of with the OMC Plant 2 remedial investigation IDW or during the harbor remedial action.

SECTION 5

References

CH2M HILL. 2004. *Remedial Alternatives Array Document and Data Gaps Analysis Report, Waukegan Harbor AOC.*

Illinois Environmental Protection Agency (IEPA). 1994. *Waukegan Remedial Action Plan, Stage I and II, Final Report.*

United States Army Corps of Engineers (USACE). 1995. *Waukegan Approach Channel Dredging, Tier 1 Sediment Evaluation.*

United States Environmental Protection Agency (USEPA). 2002. *Second Five-Year Review Report for Outboard Marine Corporation Superfund Site, Waukegan, Lake County IL.* 23 pp.

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———. 1992. *Guide to Management of Investigation-Derived Wastes.* 9345.3-03FS.

———. 1985. *National Enforcement Investigations Center (NEIC) Policies and Procedures.* EPA-330/9-78-DDI-R.

———. 1990. *Specifications and Guidance for Obtaining Contaminant-Free Containers.* OSWER Directive #9240-05A.

Tables

TABLE 1-1
Description of Alternatives
Waukegan Harbor RD

Alternative No.	Dredging[a]	Contaminated[a] Sediment Disposal	Uncontaminated Sediment Disposal[c]	Other
1A	All contaminated sediment removed. Shallower portions of federal navigation channel dredged to 18 ft LWD.[b]	OMC Property	Uncontaminated material at WCP or as residual cover layer	Larson Marine and Port Authority docks left in place
1B	All contaminated sediment removed. Shallower portions of federal navigation channel dredged to 18 ft LWD.[b]	Subtitle D Landfill	Uncontaminated material at WCP or as residual cover layer	Larson Marine and Port Authority docks left in place
2A	All contaminated sediment removed. Shallower portions of federal navigation channel dredged to 18 ft LWD.[b] Material removed from former Slip 3.	OMC Property Material from Slip 3 goes to TSCA Landfill	Uncontaminated material at WCP or as residual cover layer	Larson Marine and Port Authority docks removed and replaced/relocated
2B	All contaminated sediment removed. Shallower portions of federal navigation channel dredged to 18 ft LWD.[b] Material removed from former Slip 3.	OMC Property Treatment of material from Slip 3 with disposal on OMC Property	Uncontaminated material at WCP or as residual cover layer	Larson Marine and Port Authority docks removed and replaced/relocated

[a] Contaminated sediments defined as containing total PCB concentrations greater than 1 ppm but less than 50 ppm. Note PCBs > 50 ppm are not anticipated but, if found, would require disposal offsite at a TSCA permitted landfill.

[b] Where the water depth is currently greater than -18 feet LWD, the remedial action will maintain minimum of current bathymetry in navigation channel.

[c] This uncontaminated material may include contaminated sediment that is treated to levels rendering it uncontaminated.

TABLE 2-1
Summary of Sediment Sampling and Rationale
Waukegan Harbor RD

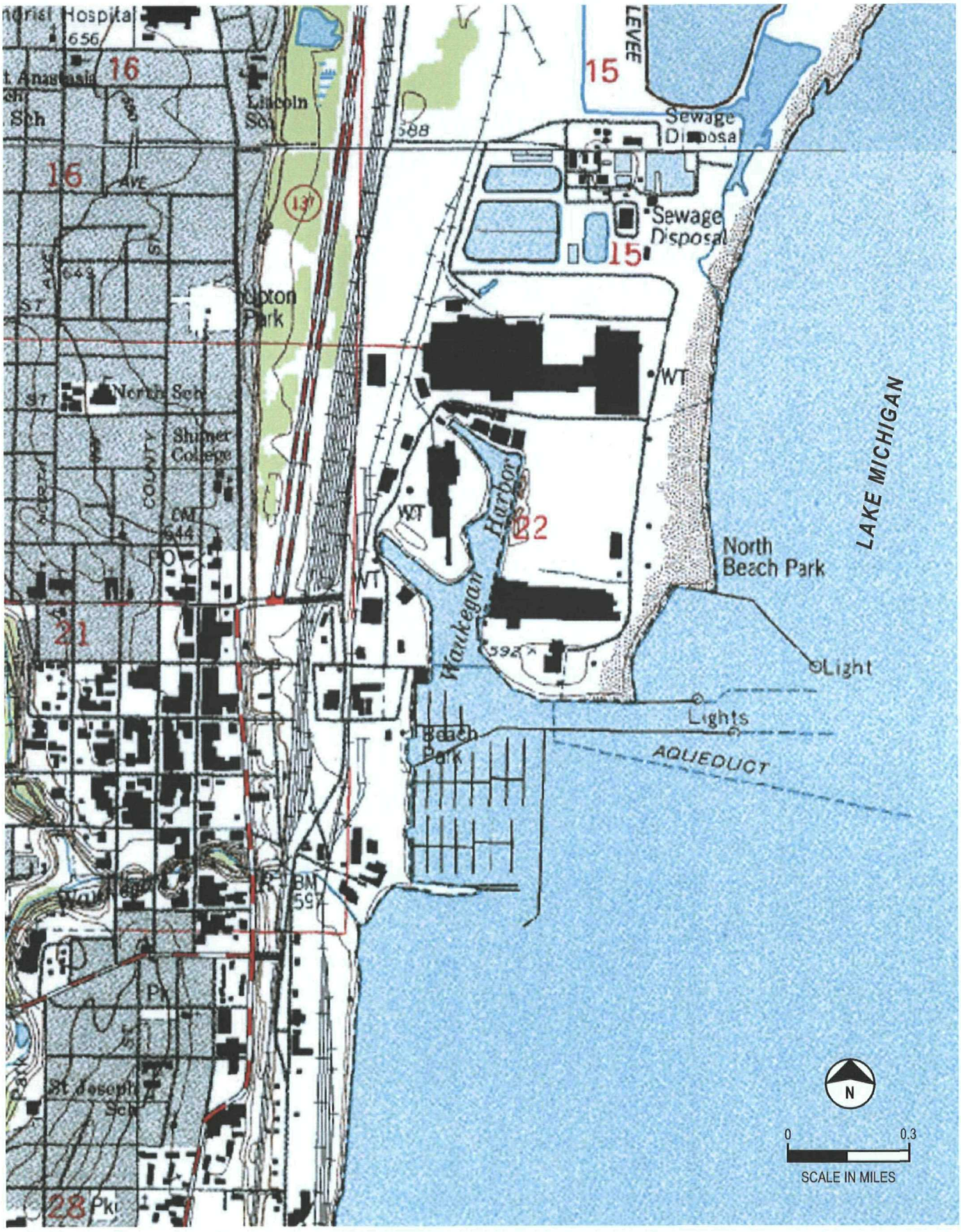
		PCB Analysis			TOC Analysis		Other Analyses[a]	
Area	Estimated Number of Cores	PCB Sampling Approach	Estimated Number of Samples[a]	PCB Sampling Rationale	TOC Sampling Approach	Estimated Number of Samples[a]	Other Analyses Sampling Approach	Estimated Number of Samples[a]
North Harbor	8	Analyze entire section of silt and sand as one composite (maximum 12" sections); analyze up to top 12" section of till (clay)	16	Limited soft sediment (silt and sand) thickness; elevated PCB concentrations; vertical delineation of PCBs not necessary	Analyze surficial sample to assess bioavailability in non-navigation area	12	Analyze minimum of 10% of the cores (12" core sections)	4
Inner Harbor Extension	5	Analyze entire section of silt and sand as one composite (maximum 12" sections); analyze up to top 12" section of till (clay)	10	Limited soft sediment (silt and sand) thickness; elevated PCB concentrations; vertical delineation of PCBs not necessary	Analyze minimum of 10% of the core samples (12" core sections)	2	Analyze minimum of 10% of the cores (12" core sections)	2
Slip 1	2	Analyze surficial sample (top 4" section) only	2	Evaluate current PCB concentrations of dredged area	Analyze surficial sample to assess bioavailability in non-navigation area	2	Not required	0
Inner Harbor	11	Analyze 12" maximum sections of silt and sand. Segregate silt and sand media, if possible. No till (clay) samples collected (none projected to be <18' below LWD)	66	Elevated PCB concentrations; vertical delineation of PCBs not as important	Analyze minimum of 10% of the core samples (12" core sections segregated by sediment type [silt, sand])	12	Analyze minimum of 10% of the cores (12" core sections segregated by sediment type [silt, sand])	12
Marina	8	Analyze top 4" core sections of silt followed by 6" core sections of silt; analyze 12" core sections of sand; no analysis of till (clay) required	96	Analysis of top 4" for assessment of bioavailability. Vertical delineation of PCB extent important due to the potential high cost of sediment removal around docks of Marina	Analyze surficial sample to assess bioavailability in non-navigation area	22	Analyze minimum of 10% of the cores (12" core sections segregated by sediment type [silt, sand])	14
Entrance Channel	7	Analyze 6" core sections of silt; 12" core sections of sand; up to top 12" section of till (clay)	56	Vertical delineation of PCBs necessary to allow for more accurate determination of the extent of sediment PCB concentrations > 1ppm	Analyze minimum of 10% of the core samples. Analyze 12" core sections, segregated by sediment type (silt, sand, clay).	12	Analyze minimum of 10% of the cores. Analyze 12" core sections, segregated by sediment type (silt, sand, clay).	12
Outer Harbor	12	Analyze 6" core sections of silt; 12" core sections of sand; up to top 12" section of till (clay)	96	Vertical delineation of PCBs necessary to allow for more accurate determination of the extent of sediment PCB concentrations > 1ppm	Analyze minimum of 10% of the core samples. Analyze 12" core sections, segregated by sediment type (silt, sand, clay).	16	Analyze minimum of 10% of the cores. Analyze 12" core sections, segregated by sediment type (silt, sand, clay).	16
Total	53		342			78		60

[a] Other analyses include asbestos and geotechnical parameters (specific gravity, atterberg limits, moisture content, bulk density, grain size, and organic content).
[b] Estimated number of samples does not include QA/QC samples (collocated samples, field duplicates, and MS/MSD samples).

TABLE 4-1
Sample Containers, Preservatives, and Holding Times
Waukegan Harbor RD

Analysis	Method[a]	Container	Preservation/ Storage	Maximum Hold Time
Sediment				
TCL PCBs	OLM04.3	8-oz amber glass	4°C	14 days
TOC	SW-846 9060 or EPA 415.1	8-oz amber glass	4°C	14 days
Asbestos	TEM (Qualitative) EPA 600.R-93/116	2-oz glass jar	NA	NA
Asbestos	TEM (Quantitative) EPA 600.R-93/116	2-oz glass jar	NA	NA
Sediment—Geotechnical				
Grain Size	ASTM D-422	4-oz glass jar	—	—
Moisture Content	EPA 160.3	4-oz glass jar	4°C	—
Spec. Gravity	ASTM D-854	4-oz glass jar	—	—
Atterberg Limits	ASTM D-4318	4-oz glass jar	—	—
Bulk Density	ASTM D-1895	1" polyethylene sleeve	—	—
Organic Content	ASTM D-2974	4-oz glass jar	4°C	—

Figures



SOURCE: USGS Waukegan Quadrangle Map

Figure 1-1

Site Location Map

Waukegan Harbor

CH2MHILL

Figure 1-2
Site Base Map
Waukegan Harbor

CH2MHILL

File Path: I:\UsEnvironmentalProte\322723WkHarborRD\GIS_DATA\MXDs\01-02_Waukegan_Harbor_SiteBaseMap.mxd, Date: November 17, 2004, User: MPETERSH

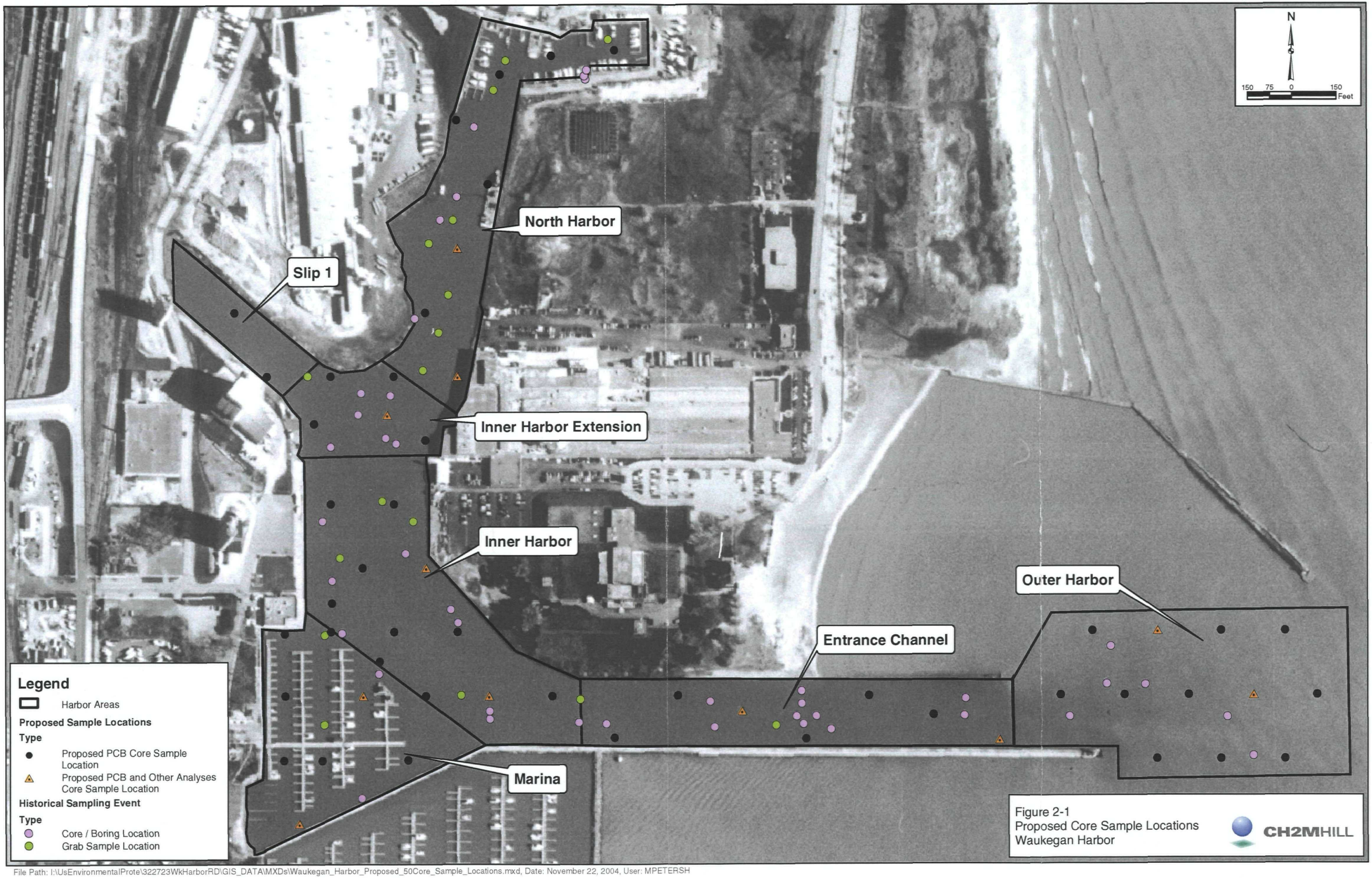


Figure 2-1
Proposed Core Sample Locations
Waukegan Harbor

CH2MHILL

File Path: I:\UsEnvironmentalProte\322723WkHarborRD\GIS_DATA\MXDs\Waukegan_Harbor_Proposed_50Core_Sample_Locations.mxd, Date: November 22, 2004, User: MPETERSH

Appendix A
Field Operating Procedures

APPENDIX A

Field Operating Procedures

The following field operating procedures to perform the field investigation at the Waukegan Harbor site are attached.

FOP Number	Title
FOP-01	Hollow-Stem Auger Drilling and Sediment Sample Collection
FOP-02	Sample Handling, Packaging, and Shipping
FOP-03	Field Logbook
FOP-04	Documentation / Chain-of-Custody Procedure
FOP-05	Decontamination of Drilling Rigs and Equipment
FOP-06	Decontamination of Personnel and Equipment

FIELD OPERATING PROCEDURE FOP-01

Hollow-Stem Auger Drilling and Sediment Sample Collection

I. Purpose

To provide a general guideline for the collection of sediment samples using hollow-stem auger drilling methods. Work will be conducted from a barge over open water.

II. Scope

The method described for hollow-stem auger sediment sampling is applicable for sediment sampling below the sediment-water interface within a water body. Specific equipment and the responsibilities of hollow-stem auger drilling subcontractors are described in the contracting documentation.

III. Equipment and Materials

- As specified in ASTM Method D-1586-99.

IV. Procedures and Guidelines

1. Position the sampling vessel (i.e., barge) over the proposed sampling location. Record the Location ID, sample coordinates (x, y), water elevation (z), weather conditions, personnel, and other relevant information.
2. Measure the depth of water using a survey rod with a 4 to 6" round plate affixed to the bottom of the survey rod. Record the water depth.
3. Measure the thickness of soft sediments using a ½ to ¾" sediment probe. Record the soft sediment thickness.
4. Ensure that augers, split-barrel samplers (split spoons), and other non-dedicated downhole equipment and sampling equipment are decontaminated in accordance with FOP-05, *Decontamination of Drilling Rigs and Equipment*.
5. Wear appropriate PPE, as required by the HSP. Change gloves between sampling locations.
6. While drilling, subsurface sediment samples will be collected continuously from the sediment-water interface to the specified depth using 2- to 4-foot-long, split-barrel samplers advanced in accordance with ASTM Method D-1586-99. Between sampling intervals, the samplers will be decontaminated in accordance with the procedures outlined in FOP-05, *Decontamination of Drilling Rigs and Equipment*. Between drilling

locations, the drill rig and downhole tools will also be decontaminated in accordance with the same FOP.

7. The drilling operators will open the sampler and present it to the field staff for logging and sampling. Log the sediment sample according to visual methods outlined in ASTM Method D-2487-98.

8. Fill all sample containers using decontaminated sampling equipment. Sediment samples for inorganic and nonvolatile organic analyses will be separated and transferred into stainless steel bowls, homogenized by mixing with a stainless steel spoon, and transferred to the appropriate sample container. Remove large pebbles and cobbles from sample before placing in jars.

9. Label, handle, and store the sample according to procedures outlined in the Field Sampling Plan. Record sampling data such as depth interval, time, and date as specified in the FSP. Discard unused sample according to the guidelines for investigation-derived waste outlined in the Waste Management Plan.

10. After a subsurface sediment sample is collected, the hollow-stem augers will be advanced to the next sampling interval. During auger advancement, a bottom plug or drill bit will be inserted into the auger to prevent sediments from collecting within the auger annulus. Before collection of the next sediment sample, the bottom plug or drill bit will be temporarily removed from the auger. This method of sampling, auger advancement, and sampling will continue to the depth of the boring.

11. The drilling subcontractor will be responsible for obtaining accurate and representative sediment samples, informing the hydrogeologist of changes in drilling conditions, and keeping a separate general log of the sediment samples collected and blow counts (i.e., the number of hammer blows required to advance the sampler 6 inches into the ground).

12. Decontaminate all non-dedicated downhole equipment (rods, sampling tubes, etc.) in accordance with FOP-05, *Decontamination of Drilling Rigs and Equipment.*

V. References

- ASTM Method D-1586-99
- ASTM Method D-2487-98

VI. Key Checks and Items

1. Verify that the drilling rig is clean and in proper working order.

2. Monitor that the drilling operator thoroughly completes the decontamination process between sampling locations.

3. Determine if a QC sample will be required at a sampling location (refer to the FSP).

4. Collect rinse water investigation-derived waste according to the procedures outlined in the Site Management Plan.

FIELD OPERATING PROCEDURE FOP-02

Sample Handling, Packaging, and Shipping

I. Purpose

The purpose of this FOP is to delineate protocols for the packing and shipping of samples to the laboratory for analysis.

II. Scope

This FOP is applicable for all samples collected and prepared for analysis at an offsite laboratory.

III. Equipment and Materials

- Waterproof hard plastic coolers
- Plastic zip lock bags
- Plastic garbage bags
- Absorbent packing material (not vermiculite)
- Inert cushioning material (not vermiculite)
- Ice
- USEPA Region 5 sample tags
- Chain-of-custody forms (generated by Forms II Lite software)
- USEPA Region 5 Custody seals
- Airbills and shipping pouches (e.g., FedEx)
- Clear tape
- Strapping tape
- Mailing labels

IV. Procedures and Guidelines

A. Prepare Bottles for Shipment

1. Arrange decontaminated sample containers in groups by sample number.
2. Check that sample container lids are tight.
3. Secure appropriate USEPA Region 5 sample tags around lids of container with string or wire.
4. Arrange containers in front of assigned coolers.
5. Affix appropriate adhesive labels to each container. Protect label with clear tape.

6. Enclose each sample in a clear; resealable, zip lock bag, making sure that sample labels are visible.

B. Prepare Coolers for Shipment

1. Tape drains shut, inside and out.
2. Affix "This Side UP" labels on all four sides and "Fragile" labels on at least two sides of each cooler.
3. Place mailing label with laboratory address on top of the coolers.
4. Place inert cushioning material (e.g., bubble wrap, preformed poly-foam liner) in the bottom of the cooler. Do not use vermiculite.
5. Place appropriate chain-of-custody records with corresponding custody seals on top of each cooler.
6. Place all the samples inside a garbage bag and tie the bag.
7. Double bag and seal loose ice in resealable, plastic, zip lock bags to prevent melting ice from leaking and soaking the packing material. Place the ice outside the garbage bags containing the samples. Place sufficient ice in cooler to maintain the internal temperature at 4±2°C during transport.
8. Fill cooler with enough absorbent material (e.g., Perlite, kitty litter, etc.) and packing material to prevent breakage of the sample bottles and to absorb the entire volume of the liquid being shipped (offsite sample shipment only).
9. Sign each chain-of-custody form (or obtain signature) and indicate the time and date the cooler was custody sealed. Record the USEPA Region 5 custody seals on the chain-of-custody forms.
10. Seal the laboratory copies of the chain-of-custody forms in a large resealable plastic zip lock bag and tape to the inside lid of the cooler. Retain the Region copies of the chain-of-custody forms for return to USEPA. Each cooler must contain a chain-of-custody form (or forms) that corresponds to the contents of the cooler.
11. Close lid and latch.
12. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.
13. Tape cooler shut on both ends, making several complete revolutions with strapping tape. **Do not** cover custody seals.
14. Relinquish to carrier (e.g., FedEx). Place airbill receipt inside the mailing envelope and send to sample documentation coordinator, along with the other documentation.

C. High Concentration Samples or NAPL Samples

When shipping high concentration samples or samples of NAPL, consult the CH2M HILL dangerous goods shipping handbook. In addition, contact the CH2M HILL dangerous goods shipping coordinator, Rob Strehlow, at the Milwaukee, WI, equipment warehouse ((414) 257-4615) for assistance.

V. Attachments

- None.

VI. Key Checks and Items

- None.

FIELD OPERATING PROCEDURE FOP-03

Field Logbook

I. Purpose

The purpose of this FOP is to delineate protocols for recording field survey and sampling information in a field logbook.

II. Scope

Data generated from the use of this FOP may be used to support the following activities: site characterization, risk assessment, and evaluation of remedial alternatives.

III. Equipment and Materials

- Field logbook
- Indelible black ink pen

IV. Procedures and Guidelines

All information pertinent to a field survey or sampling effort will be recorded in a bound field logbook that will be initiated at the start of the first onsite activity. The field logbook will consist of a bound notebook with consecutively numbered pages that cannot be removed. The outside front cover of the logbook will contain the project (site) name and the specific activity (e.g., remedial design sampling). The inside front cover will include:

- Site name and USEPA work assignment number
- Project number
- Site manager's name and mailing address
- Sequential logbook number
- Start date and end date of logbook

Each page will be consecutively numbered, dated, and initialed. All entries will be made in indelible black ink, and all corrections will consist of line-out deletions that are initialed and dated. If only part of a page is used, the remainder of the page should have an "X" drawn across it. At a minimum, entries in the logbook will include the following:

- Time of arrival and departure of site personnel, site visitors, and equipment
- Instrument calibration information, including make, model, and serial number of the equipment calibrated
- Field observations (e.g., sample description, weather, unusual site conditions or observations, sources of potential contamination, etc.)
- Detailed description of the sampling location, including a sketch

- Details of the sample site (e.g., coordinates [x, y], water elevation [z], casing diameter and depth, integrity of the casing, etc.)
- Sampling methodology and matrix, including distinction between grab and composite samples
- Names of samplers and crew members
- Start or completion time of sample collection activities
- Field measurements (e.g., water depths, sediment probe depths)
- Type of sample (e.g., sediment)
- Number, depth, and volume of sample collected
- Field sample number
- Requested analytical determinations
- Sample preservation
- QC samples
- Sample shipment information including COC form number, carrier, date, and time
- Health and safety issues (including level of PPE)
- Signature and date by personnel responsible for observations

Sampling situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. Records should, however, contain sufficient information so that someone can reconstruct the sampling activity without relying on the collector's memory. The field team leader will keep a master list of all field logbooks assigned to the sampling crew.

V. Attachments

- None.

VI. Key Checks and Items

- None.

FIELD OPERATING PROCEDURE FOP-04

Documentation/Chain-of-Custody Procedure

I. Purpose

The purpose of this FOP is to provide a definition of "custody" and describe protocols for documenting the transfer of custody from one party to the next (e.g., from the site to the laboratory). A documented custody trail is established through the use of sample tags and a USEPA chain-of-custody form which uniquely identifies each sample container, and who has possession of it from the sample's origin to its final destination. The chain-of-custody form also describes the sampling point, date, time, and analysis parameters.

II. Scope

Sample personnel should be aware that a sample is considered to be in a person's custody if the sample meets the following conditions:

- It is in a person's actual possession
- It is in view after being in a person's possession
- It is locked up so that no one can tamper with it after having been in physical custody

When samples leave the custody of the sampler, the cooler must be custody-sealed and possession must be documented.

Data generated from the use of this FOP may be used to support the following activities: site characterization, risk assessment, and evaluation of remedial alternatives.

III. Equipment and Materials

- Computer with Forms II Lite software loaded
- Printer with paper (8.5- × 11-inch) and ink cartridge (black or color)
- USEPA Region 5 Sample Tag
- Forms II Lite generated tag label (encouraged, but not mandatory)
- Indelible black ink pen

IV. Procedures and Guidelines

A. Chain-of-Custody Forms

The chain of custody form must contain the following information:

- CASE NUMBER/CLIENT NUMBER: If a CLP laboratory is used, enter the case number provided by EPA's RSCC. If the CLP is not used, enter the SAS number provided by CH2M HILL's Sample & Analytical Coordinator.
- EPA REGION: Enter Region "5".

- CERCLIS ID: For Waukegan Harbor, use "ILD000802827".
- SPILL ID: For Waukegan Harbor, use "0528".
- SITE NAME/STATE: For Waukegan Harbor, this will be "WAUKEGAN HARBOR", "IL".
- PROJECT LEADER: Enter the CH2M HILL site manager.
- ACTION: For Waukegan Harbor, choose "Remedial Design".
- SAMPLING CO.: "CH2M HILL".
- SAMPLE NO.: This is the unique number that will be used for sample tracking. For CLP, this number is taken from a block of numbers assigned by the EPA RSCC. For non-CLP, the CH2M HILL Sample & Analytical Coordinator will assign this number.
- MATRIX: Describes the sample media (e.g. Sediment etc.).
- SAMPLER NAME: The name of the sampler or sample team leader.
- CONCENTRATION: Low (L), Low/Medium (M) or High (H).
- SAMPLE TYPE: "Grab" or "Composite".
- ANALYSIS: This indicates the analyses required for each sample.
- TAG NO.: This number appears on the bottom of the sample tag and includes a prefix ("5") followed by a series of numbers. The entire number must appear on the chain-of-custody form.
- PRESERVATIVE: Document what preservative has been added to the sample (e.g. "HCl", "Ice Only", "None").
- STATION LOCATION: This is the CH2M HILL Station Location Identifier.
- SAMPLE COLLECT DATE/TIME: Use military time.
- QC TYPE: This is for field QC only, and includes field duplicate, field blanks, equipment blanks, and trip blanks.
- DATE SHIPPED: The date that samples are relinquished to the shipping carrier.
- CARRIER NAME: (e.g., "FedEx").
- AIRBILL: Airbill number used for shipping (if samples are hand delivered to their destination, "Hand delivered" should appear in this field).
- SHIPPED TO: This is the laboratory name and full address, including the laboratory contact. If the contact is not known, use "Sample Custodian".
- CHAIN OF CUSTODY RECORD fields: This sampler's signature must appear in the "Sampler Signature" and the "Relinquished By" fields. The date and time (military time) must also be included. If additional personnel were involved in sampling, their signatures should appear in the "Additional Sampler Signature(s)" field.

Although the samples are "relinquished" to the shipping carrier, the shipping carrier does not have access to the samples as long as the shipping cooler is custody sealed. Consequently, the shipping carrier does not sign the chain-of-custody form.

- SAMPLE(S) TO BE USED FOR LABORATORY QC: This identifies which samples are to be used for matrix spike/matrix spike duplicate analyses.
- Indicate if shipment for case is complete: Use "Y" or "N".
- CHAIN-OF-CUSTODY SEAL NUMBER: Record the custody seal numbers that appear on the Region 5 custody seals that can be found on the shipping container. There is usually a minimum of two per shipping container.

B. Sample Tags

Each sample container will be identified with a uniquely numbered sample tag issued by USEPA Region 5. Each tag will contain the following information:

- Case/SAS number
- The unique sample number for sample tracking
- CH2M HILL station location (i.e., the sample identifier)
- Date of sampling
- Time the sample was collected (in military time)
- All parameters for which the sample will be analyzed
- Preservative used (if any)
- Sample type (grab or composite)
- Sample concentration (low, medium, high)
- Sample matrix (sediment, etc.)
- The signature of sample team leader
- Identification when sample is intended to be used by the lab for matrix spike/spike duplicate

V. Attachments

- Attachment 1: Forms II Lite Quick Reference Guide
- Attachment 2: Example Chain-of-Custody Form, Sample Tag, Custody Seal

VI. Key Checks and Items

- All sample containers must be properly tagged.
- Each cooler must have a chain-of-custody form and the samples in the cooler (as identified by the sample tags) must match what is on the chain-of-custody form.
- Each chain-of-custody form must be properly relinquished (signature, date, time).
- The custody seal numbers must be written on each chain-of-custody form.
- The shipping cooler must be custody sealed in at least two places.

FOP-04, Attachment 1
Forms II Lite Quick Reference Guide

Getting Started

(a) Click on the **Start** button on the Windows Desktop and select **Programs**. Select **Forms II Lite** and click on the FORMS II Lite item. The FORMS II Lite application will begin.
(b) Click **File** on the Main Menu bar. Click on the **New Site** item. The first data entry screen will appear.

Step 1 - Enter Site Information

a) Enter all relevant information necessary for Chain-of-Custody paperwork (in accordance with Regional guidance). For CLP Traffic Reports (TRs) this includes:
   - Site Name
   - State
   - EPA Region Number
   - CLP Case Number
   - Lead Sampler

b) Click the **Next** button to proceed to Step 2.

Step 2 - Select Sampling Team

a) Select sampling team members from the **Unassigned Team Members** window by clicking on each name.
b) Click the > button. The selected name will move to the **SelectedTeam** window. Repeat until all team members for this sampling event are selected.
c) Click the **Add/Edit Team Members** button to add any remaining sampling team members names that do not appear in the **Unassigned Team Members** window.
d) Enter the first and last name of each sampler. If you would like to add the sampler to the permanent list, click the **Add to Permanent List** box. After you have entered the samplers' names, click the **OK** button. These samplers will appear in the **Selected Team Members** window on the Select Sampling Team screen.
e) Click the **Next** button to proceed to Step 3.

Step 3 - Select Analysis

a) Select an analysis from the **Available Analyses** window by clicking on the analysis.
b) Click the > button. The selected analysis will move to the **Selected Analyses** window. Repeat until all analyses to be performed on samples collected for this sampling event are selected.
c) To edit Turnaround Time, click the **Edit Turnaround Days** button. The **Edit Project and Turnaround** screen will appear.
d) Click on the **Turnaround Time** drop down menu to select the number of days or type in a value. Click **Close** to close screen.
e) Click the **Next** button to proceed to Step 4.

Step 4 - Enter Station

a) Enter all relevant information necessary for Chain-of-Custody paperwork (in accordance with Regional guidance). For CLP TRs this includes:
   - Station Name and Location
   - Sample Matrix
   - Sample Date/Time
   - Sample Type
   - Sampler Name

b) The Sample Date/Time field is strictly military time. You may click on the System Date/Time checkbox to populate the current system date/time value into the sample date/time.

c) Click the **Add Station** button to enter the name of a new station and continue with the station locations. To enter a new station location associated with a previously entered station, click on the station name, then click the **Add Location** button, and enter the name of the new station location.

d) Click the **Next** button to proceed to Step 5.

Step 5 - Assign Bottles and Samples

a) Select the Station Location from the **Station/Location** window.

b) Select the analyses associated with the containers from the **Analysis** window. If more than one analysis is associated with a container, select the additional analysis(es) by holding down the control key, and clicking on the additional analysis(es).

c) Enter the number of bottles that will be assigned a specific analysis or set of analyses.

d) Enter the sample tag prefix and starting tag number. Click **Auto Increment Tag Number** if you wish to assign sequential tag numbers for your sampling event. Sample numbers are automatically and sequentially assigned for your sampling event and are unique per Station Location.

e) By default CLP sample numbers are automatically used for CLP analyses. Note that FORMS II Lite generates CLP sample numbers using a BASE 32 system which differs from the CLASS generated CLP sample numbers.

f) Edit the sample number and other pertinent information for these samples in the space provided. After you have confirmed your entries, click the down arrow.

g) Repeat steps 5b through 5f until all desired analyses have been assigned to bottles.

h) Click the Next button to proceed to Step 6.

Generate Labels

a) Click the **Generate Labels** button in Step 5. The application automatically displays samples for the current Station Location. These are the samples for which labels will be generated. Click the appropriate checkbox at the bottom of the screen to select all samples for the station or site. Enter the number of labels to print next to each record if you need more than one.

b) Click the **Generate Labels** button and select the appropriate label template to view, then click **OK.** Edit an existing template by clicking the **Edit Label** button. If you wish to add a new label template, click the **Add New Label** button and follow the wizard to create a

new template. Enter the number of blank labels to control printing on a label other than the first one on the page.

c) View the labels at the end of the edit label or new label process. If labels are not acceptable, close the view and edit the label template. If the labels are acceptable, print the labels.

d) Select **File** and then **Print** from the Main Menu bar. Select the desired number of copies to be printed and click the **OK** button to print the labels. Click **Close** to return to Step 5.

Step 6 - Select Samples and Assign Lab

a) Select a laboratory from the **Lab Code** drop down menu. If the laboratory where samples will be shipped does not appear in the list, click the **Add Lab** button and add the lab information.

b) Select samples from the **Unassigned Samples** window by holding down the [Ctrl] key and clicking on each sample that will be shipped to this laboratory. After you have selected all the samples for the laboratory, click the down arrow.

c) Repeat steps 6a and 6b until all samples have been assigned to laboratories.

d) Click the **Next** button to proceed to Step 7.

Step 7 - Select Labs and Assign Shipping

a) Enter the carrier, date of shipment and airbill.number.

b) Select samples from the **Unassigned** window by holding down the [Ctrl] key and clicking on each sample that will be shipped using this airbill. After you have selected the samples to be shipped, click the down arrow.

c) Repeat steps 7a and 7b until all samples have been assigned airbill numbers.

d) Click the **Finish** button for system generated TRs. FORMS II Lite will then display a screen that enables you to view and print TRs for the site.

e) Click **Next** and proceed to Step 8 to customize TRs for specific sets of samples.

Step 8 - Customize Traffic Report

a) Confirm the last four digits of the TR number. (The first two digits represent the Region number, the next nine digits are a random number and the next six digits are the date the TR was created, and the last four digits are automatically incremented by the system but may be edited by the user.)

b) Select a shipment from the **Shipping** window. Select the samples from the **Samples** window that will be assigned to this TR. After you have selected the samples, click the down arrow. (NOTE: samples must be of the same program type and must have the same project code to be assigned to a single TR.)

c) Repeat steps 8a and 8b until all samples have been assigned.

d) Click the **Finish** button. FORMS II Lite will display a screen that will enable you to view, print, archive and export TRs. Follow the directions to print the TRs.

Quick Edit

a) On the **View/Print TR** screen displayed after completion of Step 8, click the **Quick Edit** button.

b) The user may edit most data fields, except those in red, prior to printing a TR. Also able to sort and filter any column and print a report.

Helpful Hints to Use FORMS II Lite 4.0

This Quick Reference Guide is designed to help FORMS II Lite users enter information for their sampling events and generate bottle labels and Chain-of-Custody paperwork. FORMS II Lite provides users the flexibility to enter most of their information ahead of the sampling event.

FORMS II Lite allows users to:

- Add values that are not included in the "list and pick" menus: Select **Admin** from the Main Menu bar, enter the password to log in. **Admin** now shows the user as being **(logged in)**. Select **Reference Tables**, and choose the table that requires editing.
- Customize screens and disable non-key fields: While logged into **Admin** on the Main Menu Bar, select **Custom Features** and click on **Field Names**. Field names and non-key fields can be renamed or hidden on the screen.
- Review the data entered throughout the data entry process by clicking on the **Quick View** button in Steps 4 through 8.
- Select multiple items by highlighting the first item, then hold down the [Ctrl] key and click on the additional items. Or simply click and drag to highlight multiple items.
- Sort data displayed in windows by clicking on the column label. Click on a second column label for a secondary sort.
- Specify more than one sampler's name for samples collected at a
- specific station location. In Step 4, select a sampler's name, then click within the data entry field after the name. Type a comma and type in the second name.
- Export Site information as either a text or (.dbf) file.
- **Note:** FORMS II Lite will not allow information that has been typed over to be saved as a separate file. Once a value in a field has been replaced (edited) with a new value, the original value is lost.

User Preferences

- The following features are maintained in **User Preferences** under **Admin** on the Main Menu bar and can be turned on or off.
- Select **Copy Station** to make the button available in Step 4 to duplicate the current station and its station location information. **Copy Location** duplicates station locations.
- Select the option **Use Default Number of Bottles**, set in the Analysis Reference Tables, to populate the number of containers for each analysis in Step 5.

- Select **Assign All** to make the button available in Step 5 to assign each of the analyses to a separate container. Set the number of containers for each analysis in the bottles field or define through User Preferences.
- Select **One-Step Printing** to make this button available in Step 5 to print labels or tags with a single click. Label template, and number of copies are defined in User Preferences.

FOP-04, Attachment 2
Chain-of-Custody Form, Sample Tag, Custody Seal

USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case: R
Client No: 04CK01

Region:	5	Date Shipped:	08/30/2004	Chain of Custody Record	Sampler Signature: Joe Sampler
Project Code:	TGB 102	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
Account Code:		Airbill:	1234567890	1 Joe Sampler 8/30/04 1845	
CERCLIS ID:	ILD000802827	Shipped to:	Any Lab 1234 West 5th Street Suite 99 Whatever MN 55999 (000) 111-2345	2	
Spill ID:	0528			3	
Site Name/State:	OMC Plant 2/IL			4	
Project Leader:	Jane Sitemanager				
Action:	Remedial Investigation				
Sampling Co.	CH2M HILL				

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	QC Type
04CK01-12	Ground Water/ JOE SAMPLER	L/G	BTEX (21)	512352 (HCL), 512353 (HCL), 512354 (HCL) (3)	OMC-MW01S-01	S: 08/30/2004 13:30	

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
OFFICIAL SEAL
No. 136607

Tag Number 5- 000996

Station Number and Location

Month/Day/Year | Time

DESIGNATE Grab / Comp

Samplers (signatures) Joe Sampler

PRESERVATIVE H2SO4 ☐ HCL ☐ HNO3 ☐ NaOH ☐ Other ☐ ICE ☐

ANALYSES VOA / METALS

USE FOR MS/MSD ☐

Lab Sample Number

Remarks:

Sample Number: 04CK01-12
Station Location: OMC-MW01S-01
ANALYSIS: CLP TCL Volatiles
Sample Date/Time: 08/30/2004/ 13:30
Sample Matrix: Ground Water
Preservative: HCL
Sampler(s): JOE SAMPLER Grab
Tag Number: 512345

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = H

BTEX = (Benzene, Toluene, Ethylbenzene, Xylenes)

Number: -0606, 136607

Shipment Iced? _____

TR Number: 5-484657676-051304-0004

PR provides preliminary results. Requests for preliminary results will increase anal

Send Copy to: Sample Management Office, 2000 Edmund Halley Dr., Reston, ... 703/264-9348 Fax 703/264-9222

REGION COPY

F2V51.043 Page 1 of 1

FIELD OPERATING PROCEDURE FOP-05

Decontamination of Drilling Rigs and Equipment

I. Purpose and Scope

The purpose of this guideline is to provide methods for the decontamination of drilling rigs and drilling tools. Personnel decontamination procedures are not addressed in this FOP. For a detailed list of personnel decontamination procedures, please refer to the HSP and FOP-06, *Decontamination of Personnel and Equipment*. Sample bottles will not be field-decontaminated; instead, they will be purchased with certification of laboratory sterilization.

II. Equipment and Materials

- Portable steam cleaner and related equipment
- Potable water
- Phosphate-free detergent such as Alconox® or Liquinox®
- Buckets
- Brushes
- Distilled water
- 10 percent Isopropyl Alcohol solution
- Methanol
- ASTM-Type II Reagent-Grade Water
- Aluminum foil

III. Procedures and Guidelines

A. Drilling Rigs

Before the onset of drilling, after each core location, and before leaving the site, heavy equipment and machinery will be decontaminated using a phosphate-free detergent solution and high-pressure hot water at a designated area. The equipment shall then be rinsed with potable water. The steam cleaning area will be designed to contain decontamination wastes and waste waters, and can be an HDPE-lined, bermed pad. A pumping system will be used to convey decontamination water from the pad to the drums.

Surface casings may be steam-cleaned in the field if they are exposed to contamination at the site before use.

B. Drilling Tools

At the following times, drilling tools will be decontaminated as described above: (1) before the onset of drilling, and (2) between core locations. This will include, but is not limited to, rods, split spoons or similar samplers, coring equipment, auger bolts, augers, and casing.

Before the use of a sampling device such as a split-spoon sampler to collect sediment samples for physical characterization or chemical analysis, the sampler shall be cleaned by scrubbing with a potable water/phosphate-free detergent solution, rinsing with potable water, and then rinsing with distilled water. If equipment has come in contact with oil or grease, rinse the equipment with methanol, and then distilled water.

IV. Attachments

None.

V. Key Checks and Preventive Maintenance

The effectiveness of field cleaning procedures will be monitored by rinsing decontaminated equipment with distilled water and then submitting the rinse water in standard sample containers for analysis as Equipment Blanks. Each time a sampling event occurs, at least one such quality control sample shall be collected, as specified in the QAPP. At least one piece of field equipment shall be selected for this procedure each time the equipment is washed. An attempt should be made to select different pieces of equipment for this procedure.

FIELD OPERATING PROCEDURE FOP- 06

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Distilled water
- 2.5 percent (W/W) Alconox®, Liquinox®, or equivalent phosphate-free detergent and water solution
- 10 percent Isopropyl Alcohol solution (DO NOT USE ACETONE)
- Large plastic pails or tubs for Alconox®, Liquinox®, or equivalent and water, scrub brushes, squirt bottles for detergent solution, methanol and water, resealable plastic bags and sheets
- Methanol
- DOT approved, 55-gallon drum (or equivalent) for disposal of waste
- Unpowdered chemical-resistant gloves
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. Personnel Decontamination

To be performed after the completion of tasks whenever the potential for contamination exists, and also upon leaving the exclusion zone.

1. Wash boots in detergent solution, then rinse with water. If disposable latex booties are worn over boots in the work area, remove and discard into a DOT-approved, 55-gallon drum.
2. Remove and discard outer chemical-resistant gloves into a DOT-approved, 55-gallon drum.

3. Remove disposable coveralls ("Tyveks") and discard into a DOT-approved, 55-gallon drum.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the workday, shower entire body, including hair, either at the worksite or at home.
7. Sanitize respirator (if worn).

B. Sampling Equipment Decontamination—Other Equipment

Reusable sampling equipment is decontaminated after each use as follows:

1. Wear unpowdered chemical-resistant gloves.
2. Rinse and scrub with potable water.
3. Wash all equipment surfaces that came into contact with the potentially contaminated sediment/water with detergent solution.
4. Rinse with potable water.
5. Rinse with distilled water.
6. If equipment has come in contact with oil or grease, rinse the equipment with methanol and then distilled water.
7. Completely air dry or wipe dry with a clean paper towel. Wrap exposed areas with aluminum foil (shiny side out) or enclose equipment in clean plastic for transport and handling if equipment will not be used immediately.
8. Collect all rinsate and dispose of in a DOT-approved, 55-gallon drum.
9. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved, 55-gallon drums.

C. Health and Safety Monitoring Equipment Decontamination

1. Before use, wrap contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with detergent solution, then a towel wet with alcohol solution, and finally two times with a towel wet with distilled water. Dispose of all used paper towels in a DOT-approved, 55-gallon drum.

D. Sample Container Decontamination

The outside of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with detergent solution, or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels in a DOT-approved, 55-gallon drum.

V. Attachments

None.

VI. Key Checks and Items

1. Do not use acetone for decontamination.
2. Drum all contaminated rinsate.
3. Clean with solutions of Alconox®, Liquinox®, or equivalent phosphate-free detergent, isopropyl alcohol, and distilled water.